

Reprocessing of fecal contaminated carcasses and the use of antimicrobials

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Background

- Fecal contamination
 - Aesthetic concerns
 - Microbiological concerns
 - Assumption made that presence of fecal material will lead to more pathogen contamination
 - All animal species treated equally (with respect to fecal contamination)
 - Skin on not the same as skin off

Reprocessing background

- 0.5 to 1.0% of processed broilers require reprocessing (45 - 90 million carcasses)
- Blankenship *et al.*, 1975 first to show that inspection passed and off-line reprocessed broilers were basically microbiologically indistinguishable

Enterobacteriaceae Counts (log cfu/ml) of Inspection Passed and Fecal Contamination-Condemed Broiler Carcasses
(Blankenship *et al.*, 1975)

Sample Method	Passed	Condemed	Condemed washed
External swab	2.59	2.61	2.59
Internal swab	2.08	2.67	2.32
Internal rinse	3.67	4.10	3.57
Carcass rinse	5.76	5.76	5.65

History

- Prior to 1989 only trimming of fecally contaminated area allowed – if internal cavity contamination, carcass could not be trimmed
- 1989 Code of Federal Regulation change – Under the supervision of a USDA inspector, reprocessing treatments allowed included trimming, vacuuming, washing, or a combination of these. If internal contamination present or treatments other than trimming are used then the entire carcass must be washed with water containing 20 ppm chlorine

Blankenship *et al.* (1993) conducted larger reprocessing study and again found no significant difference in bacterial load of inspection passes and reprocessed carcasses

Microbiological quality of conventionally processed and reprocessed broilers (Blankenship *et al.*, 1993)

Sample	APC	ENT	E. coli	% Sal
CPC Log CFU/mL	3.66	1.97	1.71	54.6
RPC Log CFU/mL	3.52	1.66	1.37	59.8

History

- Waldroup *et al.* (1993) relooked at commercial reprocessing of broiler chickens
- Used 20 ppm chlorine in the carcass wash and determined the effect that the reprocessing was having on *Campylobacter*
- They found some plant variability, but concluded that current reprocessing procedures were microbiologically justified, and that on reprocessed carcasses there were no significant difference in *Salmonella* prevalence or numbers and that *Campylobacter* were either not affected or were significantly lower than in commercially processed birds

On-line reprocessing -- visual contamination and microbiological quality of broilers Fletcher *et al.* (1997)

- On-line reprocessing reduced the need for off-line reprocessing by 73 to 84%
- *Salmonella* and *Campylobacter* incidence were not affected by on-line vs off-line treatment
- There were no significant differences treatment effects on APC, *Campylobacter* or coliform counts
- Summarized that on-line processing of visually contaminated carcasses could greatly reduce the number of carcasses being subjected to off-line reprocessing without negative effects on bacteria and pathogen counts

Effect of bird washers on carcass microbiological characteristics

Northcutt *et al.* (2003)

- No difference was found in coliform or *E. coli* counts due to washing in an IOBW
- Total aerobic plate counts were lower on carcasses from one plant, but not on carcasses from two other plants
- Washing in water alone did not significantly change carcass bacteriological characteristics

Chemicals used in reprocessing and/or chicken washes or dips

- Chlorine – up to 50 ppm
- Cecure – cetylpyridium chloride (CPC)
- Inspexx – peroxyacetic acid
- Safe₂O – acidified calcium sulfate
- Sanova – acidified sodium chlorite
- TomCO – CO₂ / chlorine system
- TSP – trisodium phosphate

Chemical applications

- With or without scrubber brush
- Dip
 - Pre-chill or post-chill
 - Chiller
- Spray
 - Continuous spray of equipment
 - External spray cabinet
 - Inside/Outside spray cabinet

Chemicals Issues and Concerns

- Export markets
- Organoleptic quality
- Water chemistry
- Worker health
- Sampling technique
 - Neutralizing active chemical in rinse sample

Selected chemical studies

Continuous Online Reprocessing (COP)

- Acidified sodium chlorite spray system
(company funded research) Kemp *et al.* 2001.
Microbiological quality of fecally contaminated carcasses was to be significantly better than that of off-line reprocessed carcasses, and all but 2 of 1,127 (0.2%) carcasses passed the zero fecal tolerance test.

**Microbiological Quality of Continuous On-line
Reprocessed Broilers (Kemp *et al.*, 2001)**

Organism	Post-evis	Post-COP	Post-OLR	Post-chill
E. coli Log cfu/ml	2.87	0.59	2.37	0.84
Campy Log cfu/ml	3.70	1.14	2.89	0.64
Salm % (+)	37.3	10.0	31.6	12.5
Campy % (+)	73.2	49.1	73.2	57.6

**Post-chill application of Acidified Sodium Chlorite
Oyarzabal *et al.* (2004)**

Sample site	Campy Rep 1	Campy Rep 2	E. coli Rep 1	E. coli Rep 2
Pre-IOBW Campy (+)	2.83 100%	2.86 95%	2.51	2.76
Post-IOBW Campy (+)	2.13 100%	2.52 95%	1.45	2.80
Post-chill Campy (+)	1.04 100%	1.22 77.5%	1.22	1.74
Post-ASC Campy (+)	0.12 12.5%	0.02 2.5%	0.00	0.00

Results demonstrate that ASC applied post-chill may be used to significantly reduce *Campy* and *E. coli* in broiler chickens

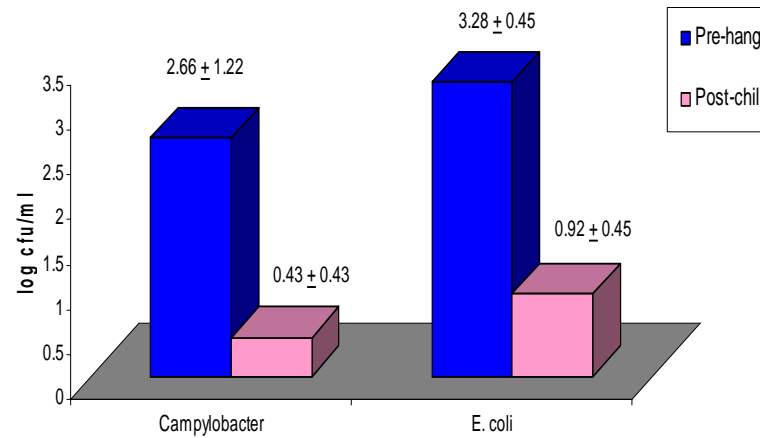
ARS / FSIS study

- 20 randomly selected plants
- 4 seasons
- FSIS collects samples (and survey information) and sends refrigerated to ARS in Athens, GA
- 20 carcass rinses post-pick and post-chill

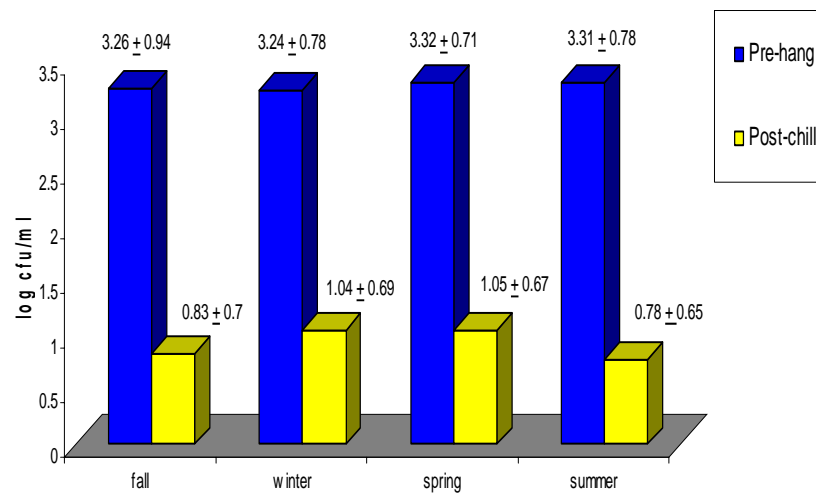
ARS / FSIS study

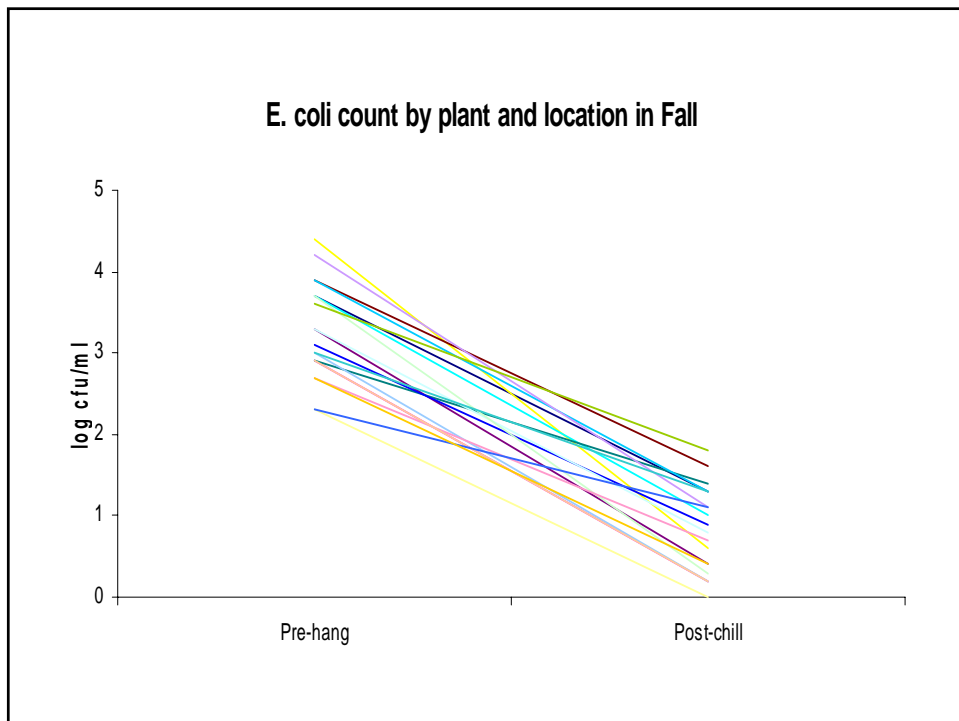
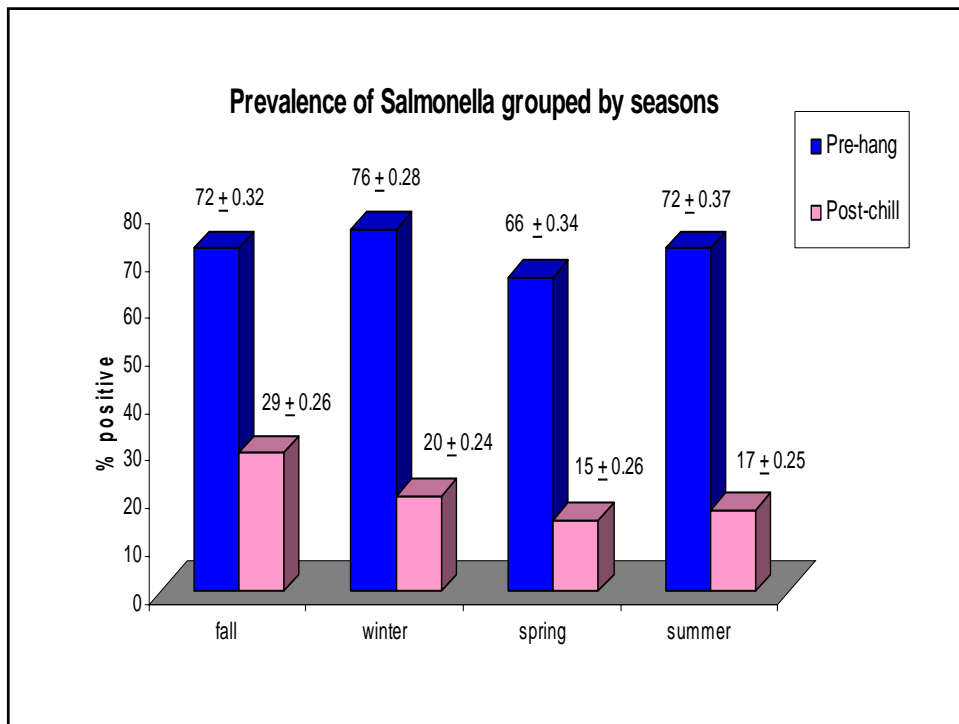
- Quantitative: *E. coli*, coliform, *Campylobacter*
- Qualitative: *Salmonella*
- Petrifilm for *E. coli* and coliforms and direct plating on Campy Cefex for *Campylobacter*
- BAX PCR with cultural back-up for *Salmonella*

Bacterial populations in chicken rinse samples



Number of E. coli grouped by seasons





Conclusions

- Reprocessing and online reprocessing can and do result in processed chickens that are equal to or have improved microbiological quality compared to inspection passed chickens
- Chemical interventions in processing are resulting in significantly improvements in prevalence of *Salmonella* and in reductions in *Campylobacter* levels in broilers
- Continued use of large quantities of chemicals may lead to increased concerns with export markets and perceived public health issues